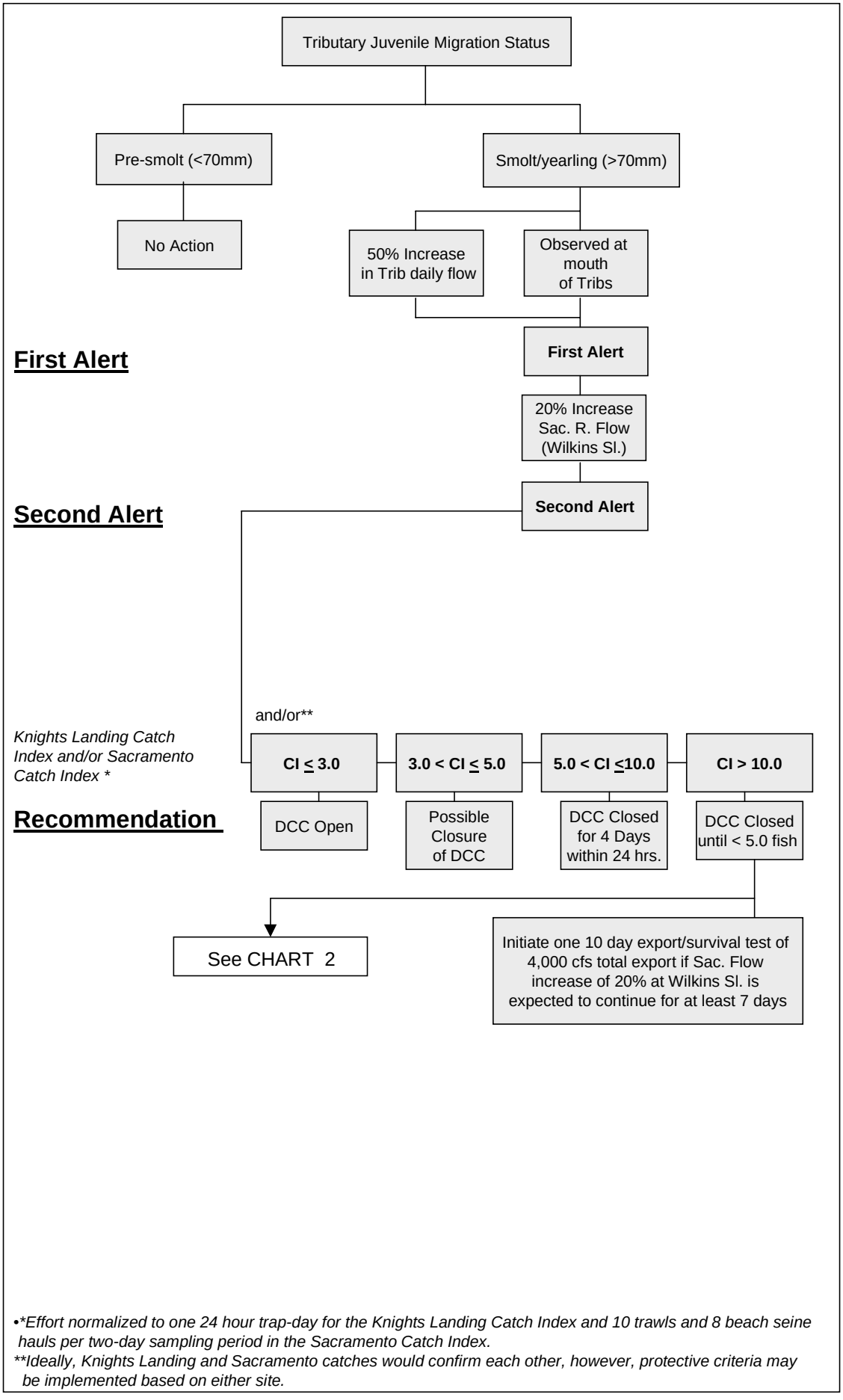
Provisional Fall/Winter Juvenile Salmon Decision Process (Oct 1 - Jan 31)



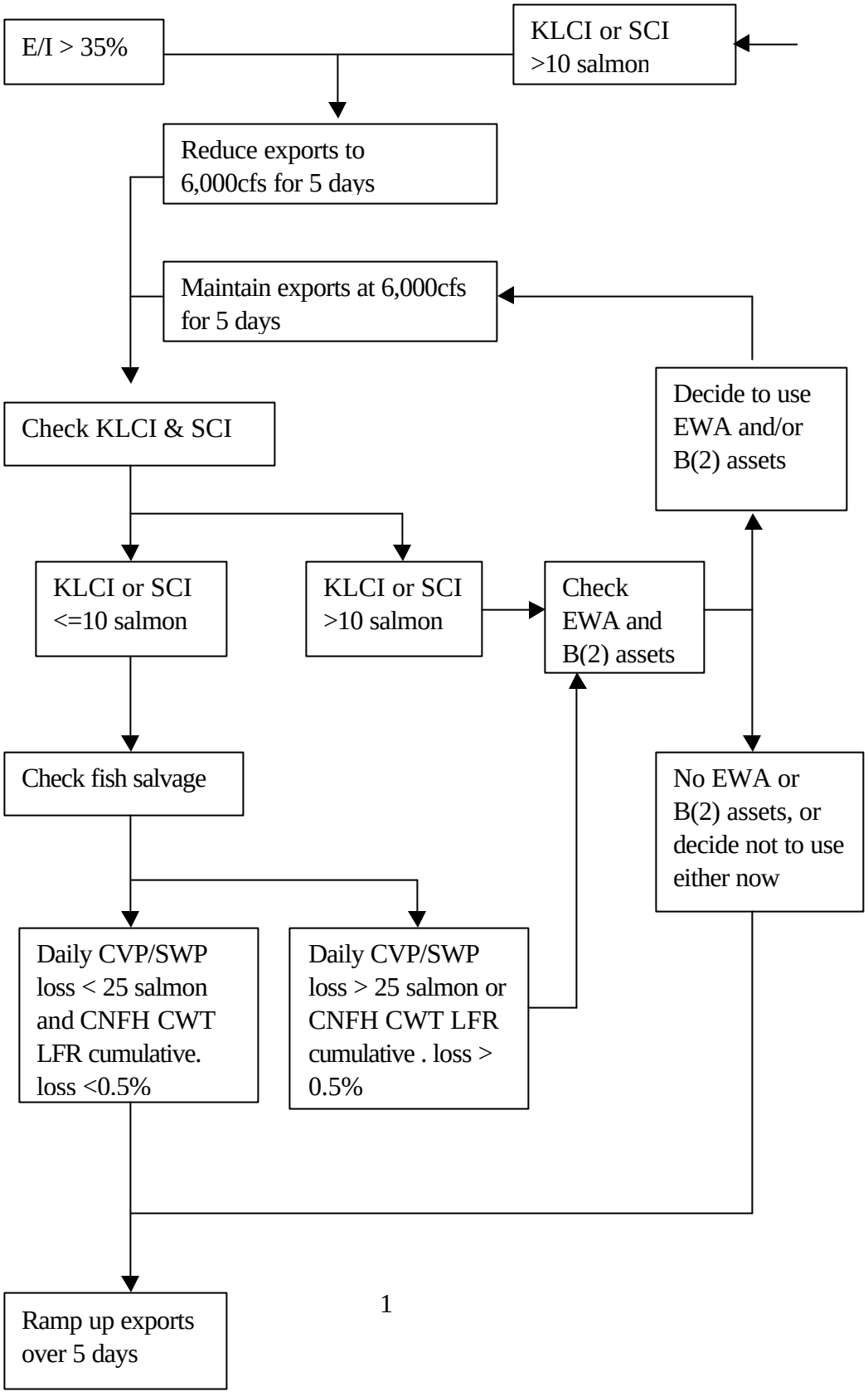
*•*Effort normalized to one 24 hour trap-day for the Knights Landing Catch Index and 10 trawls and 8 beach seine hauls per two-day sampling period in the Sacramento Catch Index.*

***Ideally, Knights Landing and Sacramento catches would confirm each other, however, protective criteria may be implemented based on either site.*

Provisional

Juvenile Chinook Salmon Protection Decision Process
Revised: 11/14/00

CHART 2 - SALMON PROTECTION DECISION PROCESS



Decision Process for October 2000 - January 2001 Juvenile Salmon Protection

This document describes the types of information, questions, and thought processes NMFS, DFG and FWS staff and other biologists will use to determine if recommendations for operational changes for chinook salmon protection in the Delta are warranted. Separate decision processes are needed for the protection of water quality and to meet water supply needs south of the Delta. All three decision processes need to be integrated to assure the most efficient operational decisions can be made. This document is not intended to add any new requirements or criteria, but to inform interested parties of the decision processes presently in use. Additional information will be obtained from a CWT smolt survival experiment during this fall and winter. The attached flow chart supplements this narrative description.

OVERVIEW

Life Stage: Juvenile chinook salmon (generally 70-270 mm, FL)

Timing: October 1 - January 31

Location: Delta

Concerns: Juvenile winter-run, late-fall-run, spring-run and fall-run chinook salmon enter the North Delta from the Sacramento Basin to rear or migrate to the ocean during the fall and winter period. A larger proportion of these migrating juvenile salmon enter the central Delta when the DCC is open than when the DCC is closed. Once in the central Delta, juvenile salmon are vulnerable to higher indirect or direct mortality. Salvage and loss of salmon in the vicinity of the export facilities also increases as exports rise. All four races of chinook salmon are either listed or candidates for listing under the ESA. Winter-run and spring-run chinook salmon are listed as endangered and threatened, respectively, under the California Endangered Species Act.

Operational Objectives:

1. Improve the survival of juvenile salmon during delta residence and migration.

2. Protect delta water quality.

3. Avoid impacts to water supply in or derived from the delta.

Potential Operational Tools to Meet Objectives:

1. Operation of Delta Cross Channel (open; closed; or open periodically based on time of day, tidal phase, or flow level.)

2. Reservoir releases.

3. CVP/SWP export levels.

4. Contra Costa Canal diversions relative to localized water quality.

5. Other

PROCESS AND RATIONALE FOR SELECTION OF PROTECTIVE ACTIONS

Phases of Salmon Migration:

I. Migration from natal area

Data of Interest: Tributary and Sacramento River mainstem rotary screw trap (RST) catches, flows, temperatures and turbidity, catch numbers, salmon sizes. mid-Sacramento River beach seine catch.

Assessment of conditions: Juvenile salmon emigration from tributaries and distribution in mainstem Sacramento, change in flow levels, temperature, turbidity (secchi). Rate of salmon movement in mainstem river.

Biological and Physical Habitat Questions:

1. Has a major daily increase in flow or turbidity occurred in the tributaries (50%) or upper Sacramento River (20%)(or a decrease in temperature)?

2. Has a noticeable increase occurred in salmon catch in tributary mouths or mainstem RSTs or seines?

3. Is the migration of juvenile salmon from tributaries essentially completed or do we think significant numbers of salmon remain in the tributaries?

4. Have unmarked salmon been released from hatcheries recently? If yes, where, when, how many, and what size?

Assessment of Concern:

1. If a major increase in flow or turbidity is seen in tributaries or upper mainstem river, then concern is medium (first alert).

2. If a major increase in salmon catch in tributary mouths and in the middle-reach mainstem river is seen, then concern is medium.

3. If flows remain stable and catch is low in mouth of tributaries and in the lower Sacramento River, then concern is low.

4. If tributary catch rises at mouth but remains stable in upper tributary, then concern is medium.

5. When parent escapement numbers are extremely low, concern is high because juvenile production is also likely to be low**.** Low abundance of juvenile salmon may reduce the ability to detect outmigration peaks and reduce confidence in the timing of protective actions and resulting benefits.

Tools: Pulse flows from Shasta may initiate downstream migration in the mainstem Sacramento River.

Recommendation: If concern is high, anticipate a recommendation for some degree of DCC closure within the next week.

II. Arrival at Knights Landing

Data of Interest: RST daily salmon catch (> 70 mm FL) at Knights Landing, Knights Landing catch index (KLCI), Sacramento flow and turbidity (NTU or secchi), hatchery releases upstream. One to three traps are fished continuously, with short-term interruptions expected during extreme river conditions. Frequency of trap checking will depend on river conditions and catch rates. The KLCI is a two-day moving average of catch per effort, standardized to 24 trap-hours of effort.

Assessment of Conditions: Change in daily catch, flow and turbidity at Knights Landing, arrival of

salmon from upper Sacramento River and tributaries.

Biological and Physical Habitat Questions:

1. Has there been an increase in daily flow or turbidity at Knights Landing?

2. Has there been an increase in RST daily catch of unmarked salmon at Knights Landing?

3. What is the travel time of salmon migrating from the tributaries or upper Sacramento River to Knights Landing? The rate of downstream migration of these salmon is relevant to the anticipated timing of their arrival in the Delta.

Assessment of Concern:

1. If the KLCI is <3.0 unmarked salmon (> 70 mm FL) and flow is stable, concern is medium.

2. If a daily increase of > 20% is seen in the Sacramento River at Colusa, then concern is high.

3. If the KLCI exceeds 3.0 salmon but is ≤ 5.0 salmon concern is meduim/high.

4. If the KLCI exceeds 5.0 salmon, then concern is high.

5. If the KLCI is greater than or equal to10.0 salmon, then concern is very high.

6. Based on historical catch at Sacramento, KLCI levels of concern generally do not occur prior to November 15.

7. If a 20% increase in flow or turbidity is seen at Knights Landing, then concern is high (Second alert).

8. If the travel time for salmon from the upper Sacramento River and/or tributary mouths to Knights Landing is short (1-2 days) and, hence, arrival of salmon in the Delta is anticipated soon, then concern is high.

9. If there is an increase in flow but the KLCI remains low, then concern is medium.

Tools: Part- or Full-time Closure of DCC, export reduction, increased reservoir releases

Recommendation: If a major increase in catch or flow is seen at Knights Landing anticipate a recommendation to close DCC within two days. (See attached Decision process chart with Knights Landing RST salmon abundance triggers and recommended actions.) Evidence of downstream juvenile salmon migration in the form of an increase in Knights Landing catch usually will be confirmed by a parallel increase in catch at Sacramento, however, such confirmation is not required to recommend implementing protective actions.

Delta Cross Channel Gates

1. If the KLCI is ≤3.0 salmon, leave DCC open (also see Decision Process chart.)

2. If KLCI > 3.0 and ≤5.0 salmon, evaluate conditions further and formulate a recommendation regarding closure of DCC. Factors affecting recommendation include the date, how many days of gate closure have been used, the pattern of salmon migration in the season to date, recent sampling information from upstream areas as an indicator of any trend in the migration. Other factors include anticipated changes in hydrology and Delta water quality. The recommendation will depend on the circumstances, potentially including a recommendation to actively operate the DCC gates daily if fall 2000 DCC experimental results suggest an acceptable operational strategy.

3. If KLCI > 5.0 and ≤ 10.0 salmon, close the DCC for 4 days within 24 hours. If after four days with the gates closed the KLCI still exceeds 5, continue with another 4-day DCC closure period . On the final day of DCC closure in such a sequence, formulate a new recommendation based on the SCI on that date.

4. If the KLCI is greater than 10.0 salmon, close the DCC gates until the KLCI is ≤ 5.0

CVP/SWP Export Pumping

5. If the KLCI is greater than 10.0 salmon, reduce total exports to 6,000 cfs for 5 days if the export/inflow ratio (E:I) is greater than 35%. Continue exports at 6,000cfs another 5 days if KLCI remains at 10 salmon after the initial 5-day period. If the KLCI is < 10 salmon, check CVP/SWP salvage; if the salmon daily loss rate is > 25 unmarked salmon or the cumulative loss of Coleman National Fish Hatchery (Coleman) coded-wire-tagged (CWT) late fall salmon at the CVP/SWP is > 0.5 percent, then maintain 6,000cfs for another 5 days, if feasible based on the EWA and B(2) water budgets (assets) for fish protection. Otherwise, ramp up exports over 5 days

6. Initiate one CWT salmon survival/export experiment in December or January with total exports at 2,000 to 4,000 cfs for 10 days when the SCI exceeds 10.0 salmon and Colusa daily flow has increased more than 20 % and is expected to remain at that higher level for at least 7 days.

III. Arrival at Sacramento

Data of Interest: The Sacramento catch index (SCI see attachment), KLCI, flow, turbidity at Sacramento, and hatchery operations (releases in upper Sacramento, Feather, or American Rivers) The SCI is the combined catch of one day of seining the mainstem between Verona and Garcia Bend, and one day of trawling the mainstem near Sacramento, normalized to a standard sampling effort for the preceding two days of sampling, or three days if sampling with either gear missed a day.

Assessment of Conditions: SCI level, change flow or turbidity at Sacramento

Uncertainties/Research Questions

1. Is turbidity a useful measurement to predict salmon movement to Sacramento?

2. Is there a correlation between salmon catch at Sacramento and tributary catch?

3. What is the range of time between salmon emigration from tributaries or upper Sacramento and the Delta? Can it be measured with reasonable certainty?

4. What factors affect the rate at which juvenile salmon migrate from rearing areas downstream to Sacramento and the Delta?

Biological and Physical Habitat Questions:

1. Have unmarked salmon > 70 mm been caught by seine or trawl that would indicate salmon have arrived at Sacramento?

2. Have unmarked salmon >70mm been caught in the Knights Landing RST?

3. Has there been a major change in daily flow or turbidity in the Sacramento River at Sacramento?

4. Have CWT Coleman late-fall run salmon released earlier in Battle Creek been observed at Sacramento or Knights Landing? What was the time interval between the release date at CNFH and the recovery date at Sacramento?

Assessment of Concern:

1. If the SCI remains at <3.0 for unmarked salmon > 70 mm and flow is stable, concern is medium.
2. If a daily flow increase at Colusa of > 20 % is seen, concern is high.
3. If SCI exceeds 3.0 salmon but is ≤ 5.0 salmon concern is medium/high.
4. If the SCI exceeds 5.0 salmon, concern is high
5. If the SCI is greater than or equal to10.0 salmon, concern is very high.
6. Based on historical catch at Sacramento, conditions causing concern generally do not occur prior to November 15.

Tools: Partial or full closure of DCC, export reduction, increased reservoir releases.

Recommendation:

Use same sequence of recommendations as above for arrival at Knights Landing, substituting SCI for KLCI.

IV. Survival through the Delta

Data of Interest: Delta seine and Chipps Island trawl catch data, Mossdale trawl catch, CVP/SWP salvage data of unmarked and CWT salmon, export level, Delta outflow (DOF) and Jersey Pt.(Qwest) flow index, San Joaquin and Sacramento inflows, temperature data, salinity data, salinity profile, DCC operations, results of survival/export experiments, Mokelumne River Hatchery and other hatchery salmon releases.

Assessment of Conditions: Changes in and magnitude of daily outflow, river inflow, salinity, temperature, export, salvage, and seine and trawl salmon catch data.

Uncertainties/Research Questions:

1. Does a change in export, Jersey Pt. flow, Delta outflow, or Delta inflow affect salmon salvage numbers or Chipps Island catch?

2. What factors influence that migration rate of salmon through the Delta?

3. Is there a relationship between salmon salvage numbers and Delta seine or Chipps Island trawl catch?

4. Does an increase in San Joaquin River inflow to the Delta reduce the number of Sacramento basin salmon entrained at the SWP/CVP?

Biological Questions:

1. Have increases in the SCI been followed by increased numbers of salmon at the SWP/CVP fish salvage facilities, in the Chipps Island trawl or in central or south Delta seines?

2. What is the rate of movement of salmon from Sacramento to Chipps Island or to the fish salvage facilities?

3. Have CWT Coleman late-fall run salmon been seen at the fish salvage facilities, in the Delta seine or in the Chipps Island trawl?

4. Are unmarked or marked yearling fall-run released from the Mokelumne River hatchery or elsewhere during the fall/winter period adding to the number of juvenile salmon seen at various

locations in the Delta, including the salvage facilities?

Assessment of Concern:

1. If salvage of juvenile salmon increases greatly, then concern is high.

2. If salvage subsequently declines, then concern also declines.

3. If the cumulative loss of CWT Coleman late fall salmon released in the upper Sacramento approaches >0.25% then concern is high. (.5% and 1% were the yellow and red light loss levels, respectively, in the last draft (1998) of the Sacramento River Spring Run Protection Plan.)

4. If the allowable 45 days of DCC gate closure for salmon protection have been used and the KLCI or SCI is equal to or exceeds 5.0 and the DCC is open, then concern is high.

5. If Delta hydrodynamic conditions are favorable (positive net downstream flows, low E/I, high delta outflow) when salmon are present, then concern is reduced.

Tools: Reduce exports.

Recommendations:

1. If the KLCI and SCI declined to < 10 salmon during the 5-day export curtailment, then check the salmon salvage numbers. If the salmon daily loss rate is > 25 unmarked salmon or the Coleman CWT late fall salmon cumulative loss is > 0.5 percent, then maintain 6,000cfs for another 5 days if feasible based on EWA and B(2) water budgets for fish protection. Otherwise, ramp up exports over 5 days.

2. If after a peak in salmon catch is seen at Sacramento, the catch of juvenile salmon in the Chipps Island trawl also increases, keep exports and DCC status stable until the Chipps Island catch declines, indicating the peak numbers of salmon observed at Sacramento have passed through the Delta.